



LSR Technologies, Inc.
898 Main Street, Acton, MA 01720
(978) 635-0123 <http://www.lsrtech.com>



Control Device for Particulate Emissions

DESCRIPTION OF THE TECHNOLOGY

With support from the Environmental Protection Agency's (EPA) Small Business Innovation Research (SBIR) Program, LSR Technologies, Inc., has developed the Core Separator, a mechanical dust-collecting device that removes micron- and submicron-sized particles from gas streams. Historically, mechanical collectors have been ineffective in removing particles with diameters of less than 10 microns.

The Core Separator System includes two conventional components, a cyclone collector for extracting solids and a fan for flow recirculation. A complete system is actually a multitude of cylindrical units, each with a single inlet for the stream to be treated and two outlets. One outlet is for the clean gas stream and the other contains a highly concentrated recirculation stream. The dust-laden recirculation stream is fed to a cyclone and returned again by means of the fan. The Core Separator component cleans the inlet stream and detains dust particles in the system. Because its efficiency is very high, most particles do not leave the system. They recirculate until collected by the cyclone. Two factors govern the performance of Core Separators: (1) high separation efficiency of the separator component, and (2) the interaction between individual components. To achieve high separation efficiency, a proper bleed-flow ratio (i.e., ratio of the recirculation flow to the total flow) is required. By controlling bleed flow, the tangential and radial velocities are controlled independently to maintain them in the desirable range.

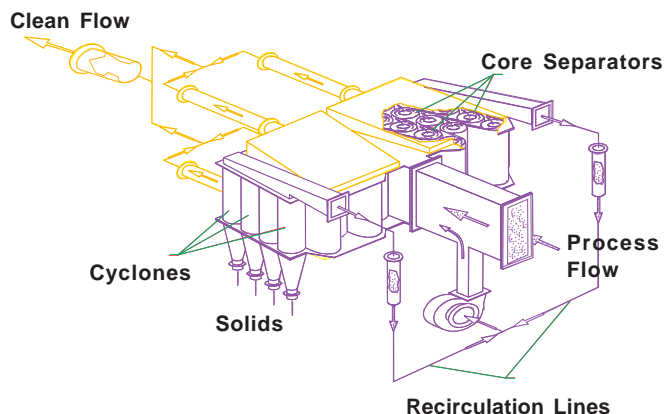
High efficiency in the Core Separator results from low particle reentrainment. The system is designed to avoid formation of toroidal vortices. Because the Core Separator component functions as a separator and not a collector, a flow U-turn within the device can be avoided. It is entirely cylindrical, and surfaces promoting the formation of vortices are moved away from the clean outlet. This theory has been verified by actual testing and through computer modeling using computational fluid dynamics to study flow fields. It should be noted that each of these factors individually cannot prevent vorticity; however, working together they achieve what each cannot independently. The conflicting processes of separation and solids collection are accomplished separately and in different components. The interaction between components is the principal means of attaining high system efficiency.

SIGNIFICANCE OF THE TECHNOLOGY

Particulate matter is being regulated as a criteria air pollutant (i.e., pollutants causing human health impacts due to their release from numerous sources) under the Clean Air Act. EPA has proposed tightening the National Ambient Air Quality Standards for the allowable levels of particulate matter, decreasing the size of the particles that must be removed from gas streams from 10 microns to 2.5 microns. Unlike other mechanical collectors, the Core Separator is capable of removing dust particles with diameters of less than 10 microns; it even can remove a high percentage of particles in the micron range. This is equivalent to the performance of a medium-efficiency

SBIR Impact

- ✦ LSR Technologies' Core Separator can remove micron- and submicron-sized particles from gas streams.
- ✦ By removing micron-sized particles from gas streams, the Core Separator reduces particulate matter emissions and the human health and environmental effects associated with this criteria air pollutant.
- ✦ More than 65 Core Separators have been sold in the United States and abroad. These units are attributed with a major reduction of particulate air emissions. For example, stack compliance testing has shown particulate emissions to be below 100 mg/nm³ when used on coal-fueled boilers.
- ✦ A Core Separator installation used for recovery of chemical catalysts by a *Fortune 500* company has produced a payback in less than 6 months.



LSR Technologies' Core Separator System consists of a series of cylindrical units, each with a single inlet for the stream to be treated and two outlets. One outlet is for the clean gas stream and the other is for the highly concentrated recirculation stream. The dust-laden recirculation stream is fed to a cyclone where solids are extracted and returned again by means of the fan, which facilitates flow recirculation.

electrostatic precipitator and better than the performance of a high-energy Venturi scrubber. Yet, the Core Separator still has the traditional advantages of mechanical collectors such as simplicity, reliability, compactness, and low maintenance.

COMMERCIALIZATION SUCCESS

There is strong demand for the Core Separator both as an air pollution control device and as a means to recover valuable product material. More than 65 Core Separators have been sold in the United States and abroad, and at least one company using the technology for recovery of chemical catalysts has experienced a payback period of less than 6 months. This product is quite significant in light of the fact that very few advances have occurred in particulate control technology in recent years.

Another emerging industrial application for the Core Separator is as a control device for collecting particulate matter upstream of regenerative thermal oxidizers, which are used in the production of wood products for the build-



More than 65 Core Separators, such as the one at the asphalt plant above, have been installed in the United States and other countries to remove dust particles from gas streams.

ing industry (e.g., medium-density fiberboard, particleboard, and oriented strandboard). The Core Separator currently is being demonstrated for wood dryer applications, and could emerge as the "Best Available Control Technology" for these processes.

AWARDS AND COMPANY HISTORY



In 1996, the Core Separator was selected for the prestigious R&D 100 Award, signifying it as one of the world's best new technology-based products of the year. LSR Technologies, Inc., is a Massachusetts-based engineering firm that offers emission control and process equipment to industrial clients. The company has supplied innovative equipment and novel solutions for difficult industrial separations since 1989. LSR equipment is in operation in numerous plants around the world for product recovery and for emissions control. LSR equipment applications include minerals and metals processing, recovery of chemicals and catalysts, coal-fired power plants, furnaces, dryers, acid gas removal, and wood-fired boilers.

What is the SBIR Program?

EPA's Small Business Innovation Research (SBIR) Program was created to assist small businesses in transforming innovative ideas into commercial products. The SBIR Program has two phases—Phase I is the feasibility study to determine the validity of the proposed concept and Phase II is the development of the technology or product proven feasible in Phase I. EPA also offers Phase II Options to accelerate the commercialization of SBIR technologies and to complete EPA's Environmental Technology Verification (ETV) Program. For more information about EPA's SBIR Program and the National Center for Environmental Research, visit <http://www.epa.gov/ncer/sbir>.